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Alkaline Washes for Fruit Trees.

In response to numerous inquiries regarding the relative strength and merits of the several materials for alkaline tree washes, now offered in the market, I give below the results of the analysis of five of the most prominent, lately made at the agricultural laboratory of the University. No. 6 gives the usual composition of Canadian crude potashes, as found in commerce, and may be taken as representing that of the lye of wood ashes when boiled down. It is the material from which No. 5, the "commercial caustic potash" is made by treatment of lime.

Composition of Commercial Alkalies.

1.—"Philadelphia solid lye," sent by R. Wheeler, Fresno.

2.—American concentrated lye, from San Francisco agencies.

3.—Double concentrated, 98 per cent caustic soda, from Greenbank Alkali Works Company, St. Helens, Lancashire, Eng. T. W. Jackson, agent in San Francisco.

4.—Refined pearl ashes, same manufacturer.

5.—Commercial potash, Langley & Michaels, San Francisco.

6.—Canadian crude potashes, commercial.

	1	2	3	4	5	6
Caustic Soda	22.7	80.4	99.3	....	....	....
Caustic Potash	....	....	....	....	52.3	....
Carbonate of Potash	....	....	....	69.1	16.8	71.4
Chloride of Potassium	....	....	....	....	....	3.6
Chloride of Sodium	66.6	5.9	....	....	4.9	....
Carbonate of Soda	...	....	....	....	....	2.3
Sulphate of Soda	...	13.2	....	....	14.8	....
Sulphate of Potash	....	....	....	....	7.5	14.4
Silica	....	....	....	....	.1	....
Insoluble Residue	....	....	....	....	2.1	2.7
Moisture	6.4	.5	....	23.8	1.5	4.5

The three first numbers represent, or should represent, the basis of the lye washes for fruit trees, the active part being the "caustic soda" or sodic hydrate, preferred to the corresponding potash compound simply because it is cheaper. The purchaser should understand that this caustic soda is all that he wants to pay for when tree-washing is his object. The rest, even though soluble in water, are to be considered as impurities of little or no practical value to him. From this point of view the "Philadelphia solid lye" should be let severely alone, two-thirds of it being common salt, which any one can put in for himself if so inclined. For tree-washing, however, salt is no manner of consequence, and is often in the way of other materials that may advantageously be combined with the lye in some cases, *e. g.* soap.

The "American concentrated lye" is a *bona fide* preparation, resulting from the treatment of commercial soda ash with lime. We have found it to range as high as 90 per cent of caustic soda, and 80 is probably as low as it goes.

The English "double concentrated 98 per cent caustic soda," from the Greenbank works is an unusually pure product, exceeding, as the analysis shows, even what is claimed in its name for its percentage of effective caustic.

A glance at the "caustic soda" percentages will show good reason why some persons, when using "one pound per gallon" of water, fail to kill the scale, while others not only kill the scale, but severely scorch the trees. It would take just *five* pounds of "Philadelphia solid" to be equal in effect to *one* pound of the Greenbank "double concentrated," or to one and a quarter of the "American concentrated."

Again, if a wash containing a pound of the latter to a gallon of water is used warm, it will kill the scale and may leave the tree unharmed, while a similar proportion of the "double concentrated" would scorch the tree if used hot, but might leave it unscathed when applied cold. A pound of the "Philadelphia" would be harmless to anything but a young scale just hatched and moving. Hence the wide differences in the experience of different persons is readily explained on this ground alone.

But there are several other causes for these differences. One of the most common is that a strong lye, say a pound to the gallon, may be applied with impunity to trees that have never been sprayed and are full of moss and old bark, which, dissolving in the lye, weakens it materially. The same lye applied to a clean tree will in reality remain considerably stronger, and may scorch it.

Another, and incredibly common cause of difficulty is the failure to make all the solid lye dissolve and form a uniform solution before using it. When, as is very commonly done, the drums are merely burst open with a hatchet, the lumps of soda lye cracked a little, then thrown into the boiler and water poured on them, it takes a great deal of time, boiling,

stirring and patience to make the result correspond with what the prescription intended. A dense, heavy, oily solution will form over the bottom, and with a strong fire there will be a great deal of spluttering and bumping there; but the lumps obstinately refuse to dissolve with any reasonable degree of rapidity, and when the workmen find that the water above is pretty sharp in its action on their hands, they think it will do for the scale also, and off it goes into the spray pump. When they come down to the bottom of the boiler, the lye is "double concentrated" in dead earnest. It is extra hot, too. When this last lot goes on the trees the scale goes, of course, but the bark of the tree also. On the other hand, the scale continues to flourish where the first weak part of the lye was applied, and the general outcome is as unsatisfactory as the worst grumbler could desire.

All such difficulties can be easily avoided, and a great deal of time saved, by putting the solid lye on a (tin or sheet-iron) perforated shelor colander, so placed that the lye will be *near the surface* of the water instead of at the bottom. Then, when a lively boil is set up, there will be no spluttering. The lumps will dissolve in the shortest time that their size permits, and the result will be a solution of uniform temperature and strength throughout.

Precisely the same rule applies to the potash compounds, given in Nos. 4, 5 and 6. The chief reason for using the latter at all, notwithstanding their higher price, is, that being "deliquescent," that is, attracting water and spontaneously forming a permanent solution, by simple exposure to the air, they serve to maintain the corrosive action for a greater length of time than would the soda lye alone, unless under exceptionally favorable conditions.

In examining trees that have been sprayed with soda lye alone on a sunny day, it will sometimes be found that within an hour after the spraying, the dry portions are covered with a network of small, white needles, resembling white frost. These needles are simply solid carbonate of soda, and show that by the action of the dry air, the "causticity" of the lye has been quickly destroyed. The bland, common salsoda has taken its place, and the action is practically at an end.

It is quite otherwise when the spraying has been done on a moist or foggy day, or late in the afternoon, so that the lye remains in a liquid condition. It then goes on working for many hours, eating away the edges of the old scale, and finally reaching to the old insect or eggs inside; and, should favorable weather continue, the toughest old inhabitant may thus be destroyed in a single application.

The use of the potash compounds in connection with the soda lye aids materially in maintaining the active corrosion more or less independently of moist weather, by preventing the rapid evaporation and solidification that so often puts a premature end to it. Moreover, the potash compounds so used ultimately reach and remain in the soil, and act as a fertilizer when needed, so that the money spent on them is not gone with the insects.

Of the three commercial potash compounds, of which the composition is given above, No. 5, the "commercial caustic potash" is the most effective. It might, of course, be used alone, but for its higher price and lower grade of caustic, which would make such use rather expensive. To secure the point desired, viz., the maintenance of the fluidity of the wash in dry weather, it is sufficient to use half as much as of the soda lye. From my personal experience, I recommend *one pound of the "American concentrated lye", or four-fifths pounds of Greenbank "double concentrated," and half a pound of the "commercial potash" to two gallons of water* as the strongest wash necessary to be used, and still safe, on all dormant trees; in bad cases to be used hot, so as to show 140° in the tank, when it will reach the tree at 110° or thereabouts, varying according to the fineness of the spray and the dryness of the air. The finer the spray and the drier the air, the more the fluid will be cooled before it reaches the tree.

Instead of the 'commercial caustic potash," No. 5 of the table, Nos. 4 or 6 may also be used, if more conveniently obtainable. In that case, however, ¾ pound instead of ½ should be used with each pound of solid soda lye, and two gallons of water.

The addition of a tablespoonful of sulphur per pound of lye during the boiling is probably useful and should be tried. When consulting economy in the use of these washes, it should be remembered that fine spray is much more economical than coarse droplets, of which a large proportion falls to the ground before a wetting of the whole tree surface can be assured. *A fine jet with heavy pressure is required for fine spray.* In the case of large trees where drops from above are caught by the lower branches, a "San Jose" nozzle with ordinary pressure is perhaps as economical as any; but for small trees from which all that does not stick to the bark falls to the ground, the fine spray from a "Cyclone" or "Imperial" nozzle under high pressure is more economical.

Many persons cut back their trees severely, in order to induce a clean new growth, and also save expense in spraying. It should not be forgotten that the strong lye falling on the open cuts causes the stumps to die for one, and sometimes several inches below the cut unless the latter are waxed over. As the infested brush remains for some time a source of danger from re-infection unless promptly dealt with, it is often questionable whether it is not cheaper to include it in the spraying and prune afterward, rather than to run that risk.

In the preparation and use of the several tree washes, there is abundant room for the exercise, not only of common sense, but even for that of uncommon acumen, if good and uniform results are to be obtained. It is not at all surprising that numerous failures should occur when the matter is left to untrained workmen alone, with such miscellaneous materials as are shown in the above table of analysis.

Berkeley, Feb. 6, 1886. E. W. HILGARD.